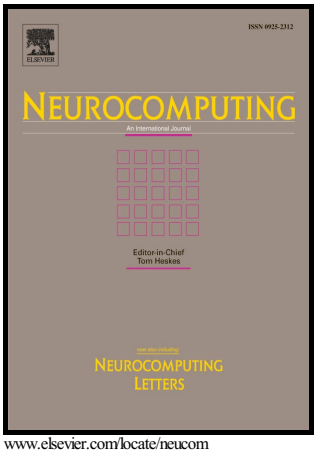

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Wladyslaw Homenda, Agnieszka Jastrzebska

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Clustering Techniques for Fuzzy Cognitive Map Design for Time Series Modeling

Wladyslaw Homenda[a,b], Agnieszka Jastrzebska[a]

[a] *Faculty of Mathematics and Information Science, Warsaw University of Technology, ul. Koszykowa 75, 00-662 Warsaw, Poland*
[b] *Faculty of Economics and Informatics in Vilnius, University of Bialystok, Kalvariju G. 135, LT-08221 Vilnius, Lithuania*

Abstract

This study presents an approach to time series modeling with Fuzzy Cognitive Maps. In the paper we focus on initial modeling phase: map nodes selection. The research objective was to introduce algorithmic means to evaluate Fuzzy Cognitive Map design before training phase. We posed a hypothesis that application of cluster validity indexes could serve us in this endeavor. In order to validate the proposed approach we have conducted a suite of experiments on various time series, both synthetic and real-world. Five cluster validity indexes turned out to be especially valuable in our study. Results show that Fuzzy Cognitive Maps designed using one of the five selected indexes have superior quality. First, they are easy to interpret, because map nodes are related with the underlying data points. Second, after we train such maps, it turns out that the numerical quality of their predictions outrivals maps with other designs.

Keywords: fuzzy cognitive maps, fuzzy clustering, time series

1. Introduction

Understanding and modeling complex phenomena in our environment is among the most important problems that we face. There is a need not only for numerical approaches that express knowledge in a form of raw numbers, but

Email addresses: homenda@mini.pw.edu.pl (Wladyslaw Homenda), A.Jastrzebska@mini.pw.edu.pl (Agnieszka Jastrzebska)